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Special Issue of Nuclear Science and Engineering celebrates the Tenth Anniversary of Operations at NCERC

The National Criticality Experiments Research Center (NCERC) is a general-purpose critical experiment facility, the only one in the US and one a few that remain operational throughout the world. NCERC is located at the Nevada National Security Site (NNSS), formerly known as the Nevada Test Site, and is operated by Los Alamos National Laboratory (LANL). This year, NCERC celebrated its 10th year of operation.

To commemorate the first ten years of operations and experiments, a special issue of Nuclear Science and Engineering was prepared with papers focusing on each of the four critical assemblies and one on Radiation Test Object (RTO) measurements. A link to the open access issue can be found at https://www.tandfonline.com/toc/unse20/195/sup1?nav=tocList. Dr. Angela Chambers, the NCSP Federal Program Manager, authored the foreword for the special issue. An excerpt below provides a brief overview of the history of NCERC.

> "NCERC is the US's flagship, multi-functional, criticality experiments facility. It is one of two of DOE's remaining operational critical experiments facilities. NCERC's significant fissile material inventory and world class expertise support a variety of nuclear security missions, including nuclear criticality safety research and training, nuclear emergency response, nuclear nonproliferation, and support for other government agencies making it the only critical experiments facility of its kind in the Western Hemisphere.
>
> NCERC can trace its history back to the World War II days of the Manhattan Project's "Project Y" located at Los Alamos, New Mexico. The need for determining the critical mass for fissile materials and how that mass is affected by surrounding materials and conditions was evident during the early days of Project Y. Following two separate fatal accidents over the course of a year, in 1946, it also became evident that a way to conduct these experiments remotely was necessary to ensure the safety of the experimenters.
>
> Thus began an era of remotely operated critical experiments at Los Alamos' Pajarito Canyon, designated as Technical Area 18. Eventually, the facility became known as the Los Alamos Critical Experiments Facility (LACEF). For over 50 years, LACEF conducted an astounding number of experiments which contributed to a variety of programs related to the application of nuclear science and engineering, including space nuclear propulsion, basic measurement of nuclear parameters, kinetic behavior of chain reacting systems, nuclear weapons safety, nuclear criticality safety, development of radiation detectors, and training for the next generation of nuclear scientists and engineers.
>
> In the early 2000s, DOE decided to relocate the LACEF materials and equipment to the Device Assembly Facility at the Nevada National Security Site, formerly known as the Nevada Test Site. LANL staff began the arduous task of safely and securely disassembling and relocating the LACEF equipment and materials while working with NNSS staff to implement the necessary facility modifications and technical safety bases required to restart the operations."

The special issue was envisioned as a way to document the work done following relocation and place it within the historical context. It provides a resource to access references for the majority of the work performed over the decade. During the first 10 years of NCERC operations, almost 50 separate critical experiments have been performed utilizing the critical assemblies during 750 days of operations. Figure 1 shows the number of days of each assembly was operated each year. Approximately 20 subcritical experiments have also been performed. In addition to subcritical experiments, various measurement campaigns and training activities have been performed with RTOs, totaling more than 500 days of subcritical operations performed in the NCERC high bays. Figure 2 shows the number of days of subcritical operations performed each year.

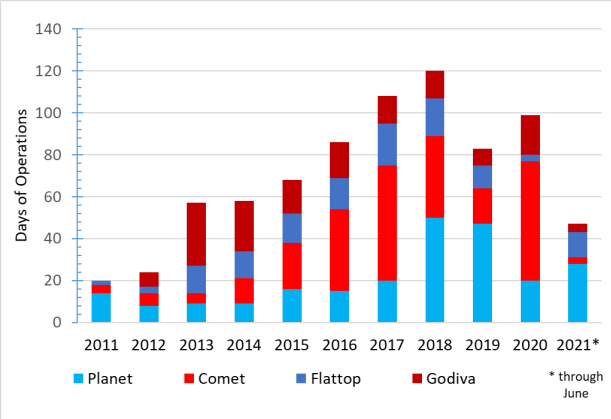

Figure 1: Critical Assembly Operations

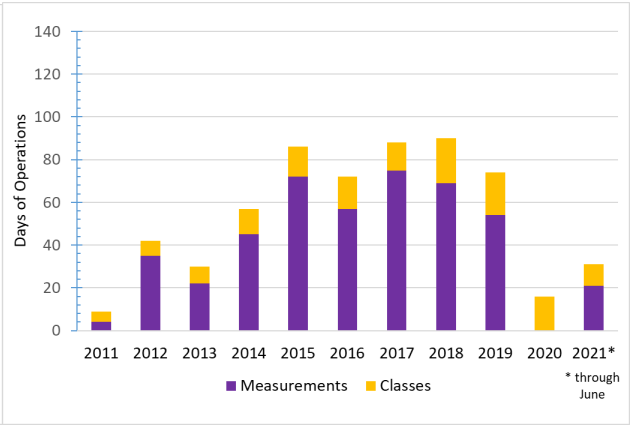

Figure 2: Subcritical Operations

Papers in the special issue are presented in a sequence that corresponds to the order the critical assemblies achieved first critical at their new home at NCERC. Planet was the first assembly to perform a critical operation at NCERC, or anywhere in the Device Assembly Facility (DAF). First critical occurred on June 15, 2011. Comet, which has a similar operating principle to Planet, was next on August 11, 2011. Flattop, with its massive stationary and moveable reflectors required careful alignment, achieved critical on November 29, 2011 with the uranium core. Flattop's other existing core, composed of plutonium, was taken critical separately, several years later on August 9, 2016. The last critical assembly to achieve criticality at NCERC was Godiva IV on October 24, 2012. One year later the first super-prompt critical operation occurred with a Godiva burst on September 10, 2013. The last paper in this issue encompasses operations with Radiation Test Objects (RTO) and Inspection Objects (IO). By design, these operations remain subcritical at all times. RTO Operations actually began while the critical assemblies were being installed and dates back to 2007, before the adoption of the designation NCERC.

A challenge coin, shown in Figure 3, was designed to commemorate the 10th anniversary. It features an image of the Device Assembly Facility façade on one side and logos for the four critical assemblies plus RTOs on the reverse.

Figure 3: NCERC 10th Anniversary Challenge Coin Design